# AGRICULTURAL NEWS LETTER

VOL. 19-NO. 3

This publication contains information regarding new developments of commercial agricultural value as discovered and field tested by the Du Pont Company. It also contains condensed reports of investigations of agricultural experiment stations and other institutions as related to the Company's products and their adaptation to agricultural purposes.

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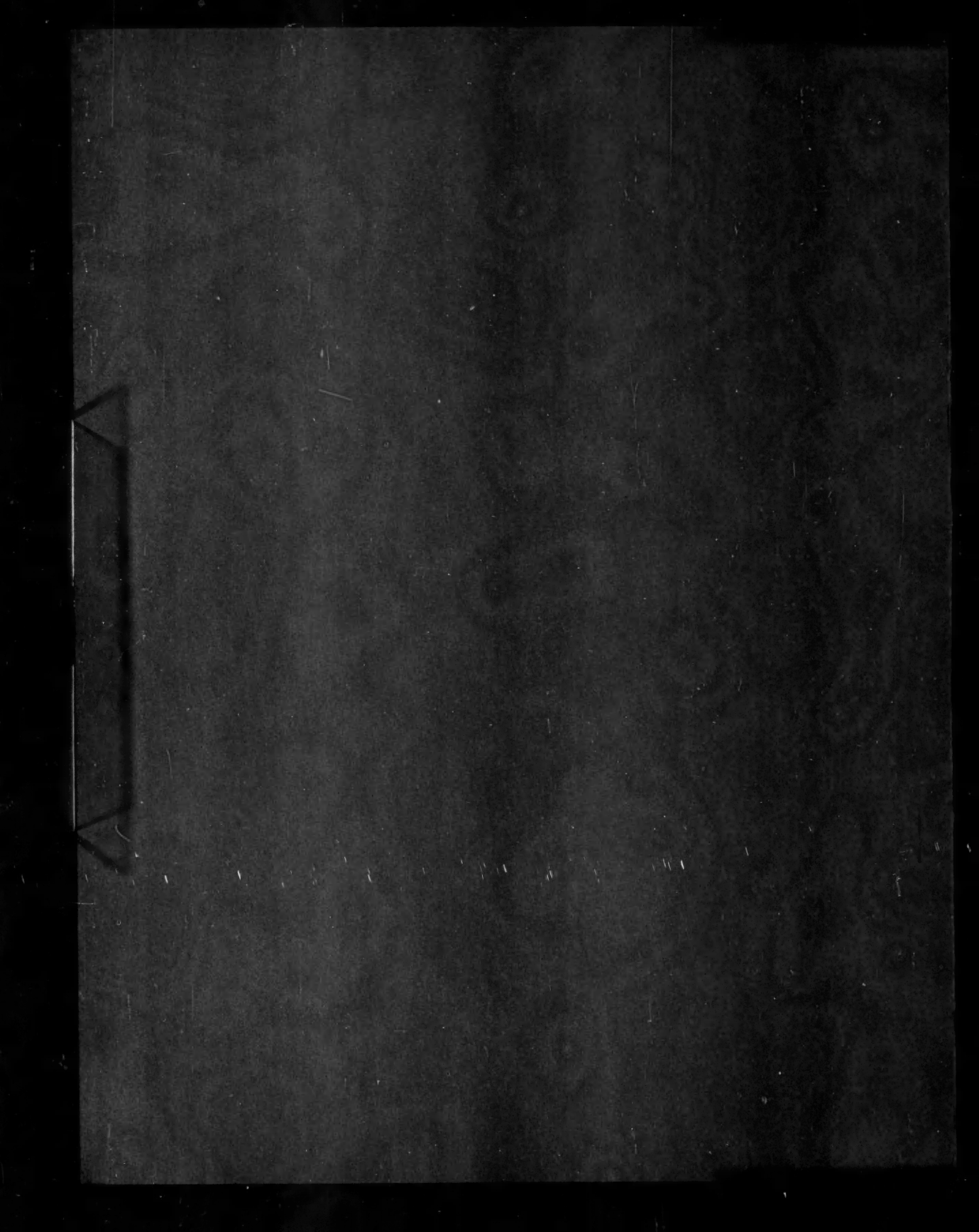

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## TCA GAINING IN IMPORTANCE AS A WEEDY GRASS KILLER

TCA (sodium salt of trichloroacetic acid) has not only proved itself in the control of many perennial weedy grasses in extensive field trials, but also is showing promise in killing annual grasses in certain TCA-tolerant crops, such as sugar beets and table beets, flax, and established alfalfa, according to Dr. L. M. Stahler, agronomist of the U. S. Department of Agriculture.

Dr. Stahler believes that TCA may become one of the farmers' most dependable killers of grass weeds such as quackgrass, Johnson grass and Bermuda grass.

Discussing recent research, Dr. Stahler pointed to several conclusions regarding use of TCA. For one thing, he says, TCA does its damage as it comes in contact with perennial weed roots. Contact with above-ground foliage has little effect on the weed, as the poison is not transferred from the foliage to the roots. Much of TCA's success, therefore, depends on leaching of the chemical down through the soil to root level. This means the poison should be applied at a time of year when soil moisture conditions or rainfall can be counted on to leach it.

### Cultivation Practices Go Hand In Hand

The advantage of using cultivation practices along with TCA -- especially with quackgrass -- has shown up in numerous experiments in the North Central States, he said. In general, a single soil pulverizing cultivation, or a turning of the quackgrass sod, at least doubled the efficiency of the killer. Cultivation alone kills some quackgrass, Stahler pointed out, and tillage forces quackgrass to give up its carbohydrate content in establishing new roots. This is a time when TCA has been found extremely effective.

Most efficient rates on quackgrass, Johnson grass, and Bermuda grass have not yet been established, but Dr. Stahler reports that the high rates in use a year ago have been proved excessive.

Used as an annual weed killer, TCA has been found to control seedlings of green and yellow foxtail (Setaria species), barnyard grass (Echinochloa species) and panic grass (annual Panicum species), without damaging sugar beets and table beets. TCA was applied as a pre-emergence treatment. Pre-emergence treatment also controlled Setaria in flax and alfalfa without damage to the crop. From this initial success, further research on controlling annual grass weeds in farm grains and horticultural crops is indicated to be desirable, Dr. Stahler said.

# LIFE-GUARDS FOR THE SEEDS OF GRASSES AND CLOVERS*

By Gilbert F. Miles
Du Pont "Semesan" Laboratory
Minquadale, Delaware

Application of chemicals to seeds to control certain plant diseases, such as the smuts of grain, is an old and well-established practice. The chemical treatment of grass and small-seeded legume seeds, on the other hand, is a very new recommendation, which has not yet been universally accepted by seedsmen and farmers.

Farmers began to treat seed wheat 200 to 300 years ago. The treatment of oats and barley dates back about 50 years; corn, 25 years; cotton, 15 years; peanuts, seven or eight years; but the grasses and clovers, only a year or two.

The introduction of any new agricultural practice is almost always accompanied by differences of opinion as to the merits of the new material or the new method.

In the field of seed treatment, there are numerous instances in which investigators differed widely in their opinion regarding the merits of a new product or a new practice. The treatment of corn, of cotton, or sugar beets, the use of only a half-ounce instead of two to four ounces of seed disinfectant per bushel of seed grain, and the slurry method -- all these and many other innovations went through similar periods of skepticism and conflicting opinions. Differences about the advantage of treating the seeds of grasses and small-seeded legumes are to be expected.

## Various Misconceptions Need Clarification

It is probably not true that grass seed treatment always pays. It is undoubtedly not true that it never pays. Somewhere between those extremes of opinion lies the truth. To illustrate some of the misconceptions which occur most frequently in connection with this newly recommended practice, consider the following typical examples:

First -- A seed analyst employed by a western seed firm wrote that he was unable to verify our claims for grass-seed treatment. He had germinated treated versus untreated grass seeds on a cellulosic material like paper. The treated seed had not germinated any better than the untreated seed. He had drawn the conclusion that grass seed treatment was not worthwhile.

*Condensation of a talk delivered at the Southern Seedsmen's Association Convention at Memphis, Tenn., December 5, 1950.

Second -- Another seed firm, in an eastern state, wrote that they had compared treated versus untreated seeds of various grasses and clovers by carefully planting them in clean sand. They, too, had arrived at the conclusion that seed treatment did not pay.

Third -- Another firm said they had planted treated and untreated Kentucky bluegrass seed in soil. The treated seed had given a 31% better stand than the untreated seed. They called our attention to some data we had released which showed that in one of our tests seed treatment had increased the stand of Kentucky bluegrass by 41%. They were puzzled by what appeared to them to be a discrepancy between our 41% and their 31% increase in stand. They suggested that possibly we had made an arithmetical error in our calculations.

## Seed Treating Does Not Stimulate Growth

Fourth -- An investigator ran some grass seed treatment tests by planting treated and untreated seed in a field experiment in July. He did get substantial increases in stand from seed treatment in the case of some species, but in many cases there was no increase in stand.

Fifth -- In this group are those who insist that seed treatment often stimulates the growth of grass and clover seedlings. They point to the fact that seedlings from treated seed often grow more rapidly than from untreated seeds, and they attribute this increased rate of growth to the stimulating action of the chemical seed treatment.

To understand what is wrong, or what we think is wrong, with the conclusions drawn in these five examples, let us look at the two principal factors involved in securing good vigorous stands of the grasses and clovers -- first, the seed; and second, the soil.

The seed consists essentially of the young plant in embryo form, often called the germ. It is more or less surrounded with a supply of carbohydrates and other nutritive substances, which we sometimes designate as the starchy part of the seed, or the stored reserve. Enclosing these two -- the embryo and the stored reserves -- is the seed coat.

## Seed Is On Its Own After Planting

The starchy part of the seed represents the food upon which the germinating seed and the seedlings must depend until they have emerged from the soil and developed their own facilities -- leaves, stem, and roots -- for producing their own food. Once it has been planted in the soil, each seed is on its own. It cannot borrow food on future production as a merchant can go to the bank and borrow cash on future earnings; neither can it borrow food from a seed lying nearby, as a housewife might borrow sugar or salt from a neighbor. The seed must either produce a plant from its own resources, or it must die.

If we think of soil as ground rock containing some chemical plant nutrients and moisture, then we are not in position to understand what takes place when we plant seeds. It is necessary to know that all except the most infertile soils are teeming with living organisms in the form of fungi, bacteria, and protozoa.

Some of these microscopic organisms in the soil are unimportant to seeds and plants. They neither help nor hinder the farmer in his efforts to grow crops. Then there are other types of organisms which are so helpful and so important to plant growth that without them crops could not be grown. The nitrifying and the nitrogen-fixing organisms are examples of this group.

## Parasitic Organisms Thrive In All Soils

There is still a third group of microorganisms, many of which are not well-known except by the harm they do to seeds and plants. These are the parasitic organisms that attack planted seeds and seedlings, causing the seeds to decay and the seedlings to damp-off, blight, and often to die.

These parasitic organisms are hardy. They can thrive in all soils, surviving the freezing of winter and the heat and drought of summer. We cannot kill them without at the same time killing the friendly organisms essential for the growth of plants. Our only recourse then is to learn to grow our crops in spite of these pests in the soil. Thus, the scene is set for the struggle between the seed an its enemies. Here is how the contest develops:

The planted seed begins to absorb water from the soil, which softens the seed coat. The seed coat ruptures and the tiny sprout and roots push out into the soil. This is the big moment for which the enemies have been waiting. They move in to attack the defenseless seed and seedling.

## Struggle Between Seeds and Enemies Varies

If the attack is vigorous, the young sprout, the roots, and the stored food may be quickly destroyed and reduced to a rotted mass.

If the attack is less vigorous, the seedling may survive, but much of the stored food will be destroyed by the enemy invaders. In that case the seedling must struggle along as best it can on a reduced portion of stored food. That means a seedling slow to emerge from the soil and weak in growing ability after it does emerge. These weak seedlings can be seen in almost all stands of grasses and clovers. Often they cannot keep pace with stronger crop seedlings and weeds in the competition for nutrients, light, and water. After a feeble effort they usually either weaken or die. Sometimes they may survive to produce a poor plant, yielding a low return in grain or forage.

In this battle between the germinating seed and its parasites, the seed often fights at a disadvantage. Conditions favorable for germination, such as low soil temperature, or too much or too little soil moisture, retard

germination and prolong the very critical period during which the seeds and seedlings are subject to attack. In such cases more and more seedlings will succumb in the battle; and the resulting crop stand will be poor, scattered, and unprofitable.

## What Seed Treatment Can Do In This Situation

Now let's see where chemical treatment of the seed fits into the picture. Suppose man intervenes in the struggle and takes steps to handicap the parasites. He can do this by coating the seed with a chemical which is poisonous to the parasite but harmless to the seed and seedling. This chemical protective barrier kills the nearby parasites, or at least checks their attack until the seed can germinate and the seedling can emerge above ground and become established.

This is the simple explanation of why a suitable chemical treatment often increases the stands of grasses and clover, and frequently increases the vigor and early growth of the seedling. These benefits account for the increased yields of grain and forage so frequently produced by seed treatment.

To make the situation still clearer, if possible, some of the things we cannot expect chemical seed treatment to do should be considered.

First, seed treatment is not a fertilizer or nutrient. It does not feed the germinating seed or seedling -- it protects it.

Second, so far as we know, seed-treating chemicals do not stimulate or speed up germination or growth.

Third, seed treatment does not improve germination; it cannot restore life to dead seeds. If the germinability of a given lot of seed is 75% before seed treatment, it is still only 75% after seed treatment. However, low seed germination is nearly always accompanied by a rather high percentage of weak seeds. Very often the protection given weak seeds by seed treatment will enable them to germinate and produce seedlings, which they could not do without seed treatment.

Fourth, seed treatment is not a substitute for high quality in seed; neither does it lessen the importance of proper attention to seed bed preparation, adequate seeding rate, soil fertility, lime, inoculation of legume seeds, and all the other well-known requirements for growing the grasses and small seeded legumes.

## Wrong Premises Of Five Examples Analyzed

Now that the function of the chemical treatment of grass and small-seeded legume seeds has been discussed, it will be of interest to review the five examples of what seemed to us to be faulty conclusions.

The first and second examples dealt with tests conducted on a paper-like medium and in sand. Since seed treatment serves chiefly to protect the

germinating seed and seedling from parasitic organisms, how then can we expect any benefit from treatments of seeds to be germinated on paper or in sand? These media contain no seed-decaying or seedling-blighting organisms such as exist in the soil. Increased germination cannot be expected under such test conditions.

The alleged discrepancy between the 31% and the 41% increases in Kentucky bluegrass stands related in the third example proves only that no two batches of seed and no two soils are the same. Soils frequently vary widely as to the population of disease-producing organisms, temperature and moisture; and consequently the results from seed treatment are subject to similarly wide variations.

The fourth example had to do with a seed-treatment experiment carried out in the field in July. Grasses and clovers, are not, however, usually planted in mid-summer, but rather in the spring or fall. At these normal planting times low soil temperatures often retard germination and prolong the critical emergence period. It is during just such periods that seed treatment can and does protect the seed from its enemies in the soil.

## What The Farmer Can Expect

The fifth example related to the claim that seed treatment stimulates the seedlings. It seems more plausible that the better growth of seedlings from treated seeds is due not to chemical stimulation, but to the relatively poorer growth of many partially decayed seeds occurring among the untreated seeds. Obviously if an untreated seed loses part of its stored food through the attacks of seed decaying organisms, we cannot expect the seedling to grow as vigorously as seedlings from seeds chemically protected against seed decay. Thus, what may look like stimulated growth on the part of the treated seeds is merely the normal growth of healthy seeds and seedlings. By comparison the poorer growth from untreated seed is the result of partial decay of many individual seeds.

In the final analysis the important question in connection with seed treatment is not so much what it will not do and what we must not expect of it, but rather what the farmer can expect of it.

He can expect a good seed treatment frequently to increase the number of emerging seedlings and the final stand of healthy seedlings by reducing the large number of seeds which rot in the soil, and by checking the loss from damping-off and seedling blight. He can expect stronger and more vigorous seedlings through the reduction in the percentage of weak seedlings resulting from partially decayed seeds.

As a result, there should be fewer failures to get a good stand of grass or legumes. There should be fewer cases in which the stand is irregular -- good in some parts of the field and poor in others. These add up to better yields for the farmer.

## How Should Seedsman Approach The Problem

What can the seedsman expect of seed treatment and what should he consider in approaching the problem? These are as follows:

1. The difference between the percentage of germinable seeds shown on the tag and the per cent stand obtained by the farmer is usually very wide. The more unfavorable the soil conditions at seeding time, the wider is that difference. Seed treatment helps to close that gap; and the wider the initial gap, the more beneicial is seed treatment.

2. Seed treatment should result in fewer complaints regarding seed quality, which are usually not the fault of the seed itself, but of the adverse soil conditions and the resulting poor stands.

3. Most kinds of grass and small-seeded legume seeds are high-value commodities. By comparison the cost of seed treatment, say a half cent's worth of chemical per pound of seed, is almost negligible.

4. Seedsmen go to great expense in cleaning, grading, and otherwise processing their seeds to provide a uniform product free of weed seeds and foreign matter. But without seed treatment they have not taken all possible steps to present their customers with the best means of obtaining a good stand of grass or clover.

5. It is seldom that the seedsman has the opportunity to purchase so much assurance for himself and so much satisfaction for his customers as when he invests in seed treatment.

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## METHODS OF CONTROLLING BROOM SNAKEWEED DESCRIBED

Good conservation measures and "Ammate" weed killer have been found effective for the control of broom snakeweed, found in many parts of the Southwest.

B. W. Allred, regional range conservationist of the Soil Conservation Service at Fort Worth, Texas, described this weed in the December, 1950, issue of SHEEP AND GOAT RAISER, published at San Angelo, Texas.

It looks like a broom, and on hot days snakes sometimes crawl into its shade, he wrote. Spanish Americans call it "Yerba de vibora" (Snake's weed), and in scientific literature it is known as "Gutierrezia sarothrae", or "Gutierrez broom", named after the Spanish botanist, Pedro Gutierrez.

A perennial plant, this half shrub "invades ranges in the Great Plains, Inter-mountain Valleys of the Southwest, Great Basin, and northern Mexico," Mr. Allred said.

"Areas where broom snakeweed has invaded usually yield low financial returns to the landowner. Expensive control practices are therefore impractical. Proper grazing, under a general conservation plan, is usually the best way to get rid of the weed... 'Ammate' has been one of the best of the chemicals tried."

## DU PONT'S PRODUCTION, RESEARCH FACILITIES GREATLY INCREASED DURING FIVE YEAR PERIOD

The Du Pont Company in 1950 surpassed all its previous production records by a wide margin. Like the chemical industry generally, it is today "in a much stronger position" to cope with the problems of a national emergency than at the start of World War II.

In its annual report, distributed this year to more than 125,000 stockholders, the company measured in concrete terms the significance to it and the nation of a construction program upon which it has spent almost 550 million dollars in the last five years.

About 460 million dollars, or 35 per cent, of the company's 1950 sales were from facilities placed in operation since 1945. Total sales for the year hit a new record high of 1,297 million dollars. That was 272 million dollars, or 27 per cent, higher than the sales figure for the previous record year of 1949.

### Chemical Industry Has Vital Role in National Security

At the same time, Crawford H. Greenewalt, the president of Du Pont, took stock of the state of its preparedness to serve the national welfare and the interests of stockholders, employees, and customers. Calling attention to the "unprecedented scope" of the chemical industry's World War II role, he declared:

"Now, as then, the ability of the chemical industry to cope with the problems of an unexpected national emergency is the direct result of its peacetime activities -- in creating new products, finding new uses for previously established products, and in expanding facilities to increase the supply of essential goods... Without minimizing the important contributions made by business units of all sizes, this demonstrates once again the dependence of the nation on enterprises capable of undertaking tasks which inherently require large resources, both technical and financial."

### Nine New Plants Built in Five Years

Du Pont has constructed nine entirely new plants and made substantial additions, improvements, and replacements at old plants since 1945. During that time it also undertook a major program of expansion and improvement of research laboratories, including the 30-million-dollar enlargement of the Experimental Station in Wilmington.

The report pointed out that since 1940 the company has increased its capacity to make nylon 2700 per cent; neoprene synthetic rubber, 1000 per cent; "Cordura" high-tenacity rayon yarn for automobile and aircraft tires, 1100 per cent; and tetraethyl lead anti-knock compounds for gasoline, 100 per cent.

Du Pont has further enhanced its preparedness by introducing commercially, from its research laboratories, new materials intended for civilian markets, but which are important national security resources.

## New Products Introduced Recently

Examples given in this category were the new wool-like synthetics, "Dacron" polyester fiber (Fiber V) and "Orlon" acrylic fiber; titanium metal for aircraft and other uses; "Teflon" tetrafluoroethylene and "Alathon" polythene resins, plastics with major industrial and military applications; and new pesticides.

Since 1940, shortly after the manufacture of nylon yarn was begun, Du Pont's nylon production capacity has increased by 27 times. Acetate rayon production capacity has been tripled since 1939, and viscose rayon output was increased 150 per cent.

To employ its capital to a greater extent in diversification into new product lines, Du Pont, the report pointed out, has undertaken to license others to manufacture certain products in short supply, such as cellophane and sodium, and is negotiating a license arrangement in the case of nylon.

## Atomic Work Undertaken at Government Request

In reporting on its acceptance of an assignment from the government to build and operate facilities for making atomic materials, the report said:

"The project is expected to involve an effort at least equal to that required in carrying out the Hanford atomic project in World War II; as in the case of the Hanford project, this is an undertaking in a relatively new and uncharted technical field.

"At the company's request, the new contract provides that the government pay all costs, that the company receive a fee of one dollar, and that any patents growing out of Du Pont's work become the property of the government of the United States. It will be recalled that the Hanford project was undertaken on the same basis...

"This project has already entailed the detachment from their regular duties of a number of the company's ablest management and technical personnel, and will undoubtedly require additional personnel of this caliber in the future. The compensation of these individuals will, of course, be paid by the government, but their withdrawal from normal commercial operations constitutes a substantial contribution by the company to the defense program."

"Chemical brush spraying is past the experimental stage. A man, with a spray gun in his hand, can reach farther, faster, and more effectively, than the same man can reach with a brush axe in his hand." ---- H. L. Jacobs, of the Davey Tree Expert Company, in talk at the Northeastern Weed Control Conference (see below).

## CHEMICAL BRUSH CONTROL ON RIGHTS--OF--WAY *

By H. L. Jacobs
Technical Service Director
The Davey Tree Expert Company
Kent, Ohio

Keeping telephone and power line rights-of-way free from unwanted woody growth is one of the big weed problems of today. It has an important place in the maintenance activities of the power line superintendent or telephone plant supervisor. Each man wants his right-of-way free of woody growth for two reasons. The first is to prevent the tall-growing species from eventually coming in contact with the wires. The second is to keep the right-of-way easy to get into and to travel over for inspection, repair, and general maintenance.

The fight against brush is an expensive and burdensome task and one in which, in the past, the line superintendent never seemed to gain ground. As one expressed it, -- "cut one 6-inch wild cherry this year, and next year you'll have six 1-inch wild cherries. Cut those six and next year you'll have 12 or more half-inch sprouts, where you originally had one tree."

In some cases foliage removal is the greatest single item of expense in line maintenance. As more rural lines are built, the drain on an ever-decreasing supply of hand labor becomes almost intolerable.

In 1945, I was asked by our company to investigate the possibility of killing brush instead of cutting it. Since then, it has been my pleasure to have a part in the development of our commercial brush spray section.

### Over 5,000,000 Gallons in Five Years

Much of the extent of this service results from the increased chemical programs of utility systems for whom we have sprayed each year since 1946. Since that time, we have applied more than 5,000,000 gallons of chemical solutions. Now in their third to fifth consecutive years, these chemical programs

*Condensation of a paper delivered Jan. 4, 1951, at the Fifth Annual Meeting of the Northeastern Weed Control Conference, held in New York City.

are replacing cutting methods in states as widely separated as New York, Pennsylvania, Ohio, Illinois, Michigan, Missouri, Kansas, and Texas.

Only two chemicals or groups of chemicals need be considered for current large-scale right-of-way work. These are ammonium sulfamate, commercially known as "Ammate" weed killer; and, 2,4-D, together with its close relative 2,4,5-T. Let's consider the latter group in terms of the commonly used present-day formulations of half and half 2,4-D and 2,4,5-T, which contains a total of 4 pounds of acid per gallon. For sake of brevity, I shall refer to these as "Brush Killers".

About 80% of our commercial work previously referred to has been based on "Ammate", although, in addition to a continuous research program, some commercial work has been done with the hormone-like chemicals since 1946. Improvements in hormone formulations and recommendations of the last two years justify giving them a more prominent place than they had previously. In 1947, one commercial formulation contained little more than three pounds of 2,4-D acid equivalent per gallon -- no 2,4,5-T. It was recommended as a foliage spray at the rate of three pints per 100 gallons and only 125 gallons per acre, or less than one and one-quarter pounds of 2,4-D acid per acre. This dosage, of 2,4-D alone, was entirely too ineffective for general control of mixed species commonly found in our Northeastern states. While generally poor killers of woody species, these early formulations, containing highly volatile isopropyl, methyl, or butyl esters, when used in the vicinity of sensitive crops and ornamentals, sometimes seemed to do more damage off the right-of-way than they did on the right-of-way.

Today, 2,4,5-T has improved the kill of the mixtures. Now we have it in equal proportions with 2,4-D. The formulations have been boosted to contain a total of four pounds of acid equivalent per gallon. Recommendations call for as much as eight pints of concentrate per 100 gallons of diluted spray. Along with this, we recognize that dense, high brush may need as much as 200 to 300 gallons per acre. Esters of relatively low volatility have replaced the highly volatile forms. These new forms, while not entirely free from danger of vapor drift injury, are decidedly safer. These improvements have made today's Brush Killers into useful tools.

## Use Best Tool For Each Job

When we compare "Ammate", and the Brush Killers, we find they differ in several ways. Some weaknesses are common to both. In some respects, where one is strong, the other may be weak. In still other ways, perhaps, there is little choice between them. We wouldn't cut brush with a cross-cut saw, nor would we cut down large trees with a brush axe. Let's look at these two products and see how they compare as tools with which to kill or control brush. I am speaking now of so-called high-volume foliage sprays where sufficient liquid is used to secure good coverage of leaves and smaller twigs.

Generally, on a mixture of species, "Ammate" is decidedly the least selective and gives a greater proportion of both top and root kill, with one application, than the best of the 2,4-D and 2,4,5-T mixtures. In 1950, foresters of the Consumers Power Company in Michigan made extensive counts of living and dead clumps following 1949 commercial spraying done by their own crews and by a contractor. These counts represented 12 genera and perhaps 30 hardwood species. Results, a full year after spraying, showed 53% of the clumps dead from hormone spraying, while 63% of the clumps sprayed with "Ammate" showed no re-growth at all.

## A Practical Yardstick

When we turn to general effectiveness on individual genera or species, some decided differences show up between the two materials. On oaks and hickories, "Ammate" gives much greater kill than can be secured with hormone sprays. This is also true of red, silver and sugar maples -- but not for boxelder. Our experience indicates that the hormones give about equal kill on boxelder stems two inches or more in diameter, and somewhat better results than "Ammate" weed killer on stems only 3 to 5 feet tall.

We expect almost complete groundline kill, and perhaps 50% root kill, with "Ammate" on white ash. As with boxelder, we secure better root kill of large ash stems than of small stems still covered with slick, unbroken cuticle. Most workers consider ash difficult to kill with 2,4-D and 2,4,5-T mixtures.

The only region where we have found basswood common in right-of-way spraying is northern New York State. There we have no difficulty in killing it with "Ammate". "Ammate" also seems a somewhat better killer of beech, sweet gum, and hawthorns than even present-day 2,4-D and 2,4,5-T mixtures.

At times, it seems a toss-up between "Ammate" and the 2,4-D and 2,4,5-T mixtures on black locust, American elm, wild cherries, elderberry and sumac. I'd give "Ammate" the edge on locust and cherry, while the Brush Killers might be ahead by a nose on sumac and elder. It's still a toss-up on the elm.

Some species are killed readily with either type of material. In some cases, 2,4-D alone is quite effective. However, such species are so seldom encountered in solid stands that use of the mixture is usually more practical. Among those killed easily by either "Ammate" or the Brush Killer mixtures are willows, birches, poplars, and sassafras.

## Corrosion Has Not Been A Serious Problem

The possible corrosive effect of "Ammate" weed killer on wires or line structures is often of interest. Spray drift, or even direct spraying of metal structures or copper wires once each five years or so can be disregarded. Thousands of miles of high brush, over low telephone lines, have been sprayed with no complaints. Spray equipment, bathed in solutions of "Ammate" constantly for weeks at a time, does corrode rather badly. This looks worse than it really is, and can be lessened by painting, oiling, and other maintenance practices.

Any herbicide used on the right-of-way must be used with care alongside crops or ornamentals. Direct spray drift from either type of material will cause damage.

Neither "Ammate", nor the hormone-like chemicals, are poisonous to livestock. None of these chemicals is a soil sterilizer and there is no danger of erosion following their use. Immediate browning of grasses is greater following use of "Ammate" since the Brush Killers have little effect on grass blades. Since "Ammate" doesn't kill grass roots very thoroughly, there's little difference a year or so later in the mantle of green which covers the right-of-way after using either material.

## Every Two Years? Or Every Five?

First cost of an "Ammate" application is somewhat higher than for an application of Brush Killer to similar brush. This difference is probably no greater in the end, because the higher level of kill calls for less frequent spraying. Most "Ammate" programs are tentatively laid out on the basis of one spray in five years, while Brush Killer programs seem to be based on three or four sprays in six to eight years.

We might sum up our comparison of these two types of materials by again considering them as somewhat different tools. Each should be used where it is best suited. By killing some roots, and by killing back and stunting many of the remaining stems, one Brush Killer spray will give a suitable degree of control for many purposes, and do it at less cost than an "Ammate" weed killer spray on the same right-of-way. Some line superintendents' budgets are such that they prefer to spread the available money over more miles of line each year, even though the kill is not so great and frequent respraying may be necessary. In other words, they may prefer to buy control, rather than kill. Some companies would rather pay more for a greater degree of kill in one spray, and have the job over with for five or six years, than to be involved with biennial spraying on each right-of-way. Where species easily killed with 2,4-D and 2,4,5-T predominate, such as willow, poplar, Osage orange, birches, sumac, and elderberry, then of course, the less expensive hormone-like sprays should be used.

## No Longer Experimental

Chemical brush spraying is past the "let's hope it works" experimental stage. The chemical tools of the future will be improved, but with those available now, brush spray programs are expanding rapidly. A man, with a spray gun in his hand, can reach farther, faster, and more effectively, than the same man can reach with a brush axe in his hand.

## TREE PLANTING ON PRIVATE LANDS SHOWS LARGE INCREASE

A very large increase in tree planting by private land owners during the fiscal year July 1, 1949, to June 30, 1950, was reported by the Forest Service of the United States Department of Agriculture. The total acreage of reforested land in the United States is now 7,200,000 acres.

The increase of reforested land for the last fiscal year amounted to 497,500 acres, compared with 364,300 acres planted in the fiscal year July 1, 1948, to June 30, 1949.

The Department of Agriculture said that state and federal foresters are particularly heartened by the increase in private land plantings. Since approximately 75 per cent of the commercial forest land in this country is in the hands of private land owners, the bulk of the timber needed for normal uses and for national defense must come from private land owners.

### Reasons For Large Increase

Causes for the spectacular rise in planting on private lands, state and federal foresters believe, are:

First -- State forest nurseries made available approximately 30 per cent more growing stock in 1950 than in 1949, bringing the total number of trees distributed close to 300,000,000.

Second -- A large number of aggressive tree planting campaigns have been carried on. Besides Forest Service activities, the Soil Conservation Service has promoted tree planting as a means of erosion control. The Extension Service has stimulated interest in the young people through 4-H Clubs. Funds are provided through the Smith Hughes Act for teaching forest management in vocational agriculture high schools.

Industry has promoted "Trees for Tomorrow" programs and tree farm projects. Pulp and paper companies have given away thousands of trees. Railroads have aided the tree planting program by hiring foresters to promote tree planting campaigns. One railroad designed a tree planting machine, and gives the design to people who want to build one.

Greatest tree planting activities in 1950 were centered in the South. Leading in reforestation work was Georgia with a total of 55,874 acres planted in 1950. Second was Louisiana with forest plantations on 46,412 acres. Florida placed third in reforestation with 42,949 acres planted. In the Northern sections of the country Michigan was high with 30,668 acres planted in 1950. Oregon turned in an exceptional planting program for the Northwest of 30,002 acres. New York led in the Northeast with 25,370 acres.

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## NEW INSECTICIDE PROMISING IN WAR AGAINST CORN BORER

A new organic phosphorus insecticide tested by the Illinois Natural History Survey, working in cooperation with Illinois canners, has proved effective for control of the European corn borer.

The new weapon against the borers, EPN-300 insecticide, developed through Du Pont research work, was tested during 1950 and showed considerable promise. It was reported, for example, to give an average of twice the residual protection of one of the newer organic phosphates in use for controlling the corn borer during the past two years. The tests were conducted under the supervision of William H. Luckmann, of Illinois Natural History Survey.

Good results were obtained from both dusts and sprays containing the new material. As a dust, a 2% EPN mixture applied at 30 pounds per acre proved one of the most outstanding treatments. Because the material is highly dispersible, a low-gallonage application of spray material was possible, with 1.8 pounds of EPN-300, equal to approximately a half pound of the active ingredient, in 28 gallons of water applied per acre. A low gallonage sprayer with all screens removed, delivering from 40 to 80 pounds pressure, was used.

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## DEPARTMENT OF AGRICULTURE OFFICIALS STRESS IMPORTANCE OF SEED TREATMENT

The Agricultural Research Administration of the United States Department of Agriculture has reminded farmers that treatment of grain seed with effective fungicides to insure better stands takes on added importance this year.

"Failure to take the precaution is not only thoughtless but reckless", a recent release by cereal pathologists of the Department of Agriculture said, noting that seed treating costs on the average only a few cents an acre. Fungicidal treatment of grain seed is mostly for the smuts and other controllable diseases of wheat, oats, and barley and for the seed rots and seedling blights of corn and sorghum.

Fortunately, the pathologists said, much seed, such as hybrid corn, is treated at the source. Also there are large-scale treating plants where farmers may take their seed for treatment.

"Farmers who hire someone to treat their seed," they said, "should make sure that the proper chemicals are used and that they are applied at the recommended rates per bushel. The county agent usually knows the situation and what is to be done." As hybrid corn now makes up nearly 80 percent of the country's corn acreage, few farmers need worry about seed rot in this crop. But sorghum growers must provide this protection by treating the seed themselves.

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## FURTHER REVOLUTIONARY CHANGES IN AGRICULTURE MAY BE EXPECTED

Although many important new agricultural chemicals have been introduced in the past decade, further "revolutionary changes in agriculture" may be expected in the future, Dr. Wallace E. Gordon, assistant director of sales of the Grasselli Chemicals Department said recently.

Dr. Gordon outlined some of the fruits of research in a talk to the national officers of the Future Farmers of America, who visited the Du Pont Company at Wilmington this spring. "Du Pont alone now markets about 30 chemicals for agricultural use which were not even in commercial existence 10 years ago," he said. But, he pointed out, much remains to be done. The fields of animal medicine and animal nutrition, for instance, have much room for development.

Young farmers of today may in their lifetimes see "more revolutionary changes in agriculture than have taken place since America was settled," Dr. Gordon said. "Commonplace commercial practices today may be outmoded in five years."

### Past Agricultural Developments Outlined

How the Du Pont Company entered the field of agriculture was explained by Dr. Gordon.

"Our first work in the agricultural chemical field began more or less as a by-product of our industrial chemical operations," he said. "About the turn of the century we began to supply lead arsenate, calcium arsenate, lime-sulfur and Bordeaux mixture to the farm market. About the same time, there was an increasing demand for dynamite used for blasting stumps, blowing ditches, lifting rocks, and improving drainage.

"In the mid-twenties we started our research on seed disinfectants, seeking chemicals for control of seed rots, seedling blights, smut in wheat, and similar diseases borne on the seed or in the soil.

## Nitrogen Extraction From Air Began In Twenties

"In the late twenties we started up our first plant for extracting nitrogen from the air -- to be used among other things for making urea, which is a fertilizer, a feed compound for ruminants, an important compound in plastics manufacture, and even an ingredient in tooth powder.

"In the field of vitamins for livestock and poultry, we started about 27 years ago with a translucent plastic-coated wire mesh which transmits ultra violet rays -- so that poultry flocks can get natural Vitamin D through sunlight. Continued study of vitamins led to the development of synthetic Vitamin D which became critically important when the war cut off natural cod-liver oil, and which is now used to fortify may poultry feeds."

Dr. Gordon said that it was only 15 years ago that the broad research program which eventually led to the commercial production of DDT, BHC, 2,4-D, and many other chemicals, started. "This research program had hardly gotten a good start when the war came along, and we had to postpone introduction of some promising new chemicals until civilian supplies of raw materials got back to normal.....

## Many Chemicals Introduced Recently

"Du Pont alone now markets about 30 chemicals for agricultural use which were not even in commercial existence 10 years ago.

"But chemical science merely stands alongside of all the other sciences in the advances which have been made in farm technology. Patient biologists who cross and re-cross various strains of plants or animals have brought us hybrid corn, more eggs per hen, more milk per cow, disease-resistant grains, and new varieties of cotton and vegetables for the vast irrigated lands of the West.

"And the engineers! Many of us stand bug-eyed at the mechanical equipment that is commonplace on so many farms... Why, you can even equip your dairy barn with a power cleaner for the gutters."

"So you say, what will they think of next?

## Many Problems Still To Be Solved

"Well, that is a serious question for every group of scientists serving agriculture. There are still many more problems to be solved than have been solved.

"Take the field of animal health for instance. Veterinary medicine has lagged far behind human medicine. You probably know that the 'wonder drug',

aureomycin, has been given credit for phenomenal gains with hogs and chickens. Some think it's because aureomycin kills predatory bacteria in the intestinal tract. If that is so, we may not know even yet what a really healthy animal can do with a given amount of feed.

"For too many years we fought animal diseases with quarantines and butcher-blocks. Severe mastitis has ruined many a good milk cow. Every poultryman knows the ills that plague a poultry flock.

"When foot-and-mouth disease broke out in Mexican cattle herds a few years ago, the Mexicans quite naturally resented the United States' attitude that all diseased or suspicious animals should be slaughtered. Even in this country we cannot afford to fight animal diseases in this wasteful way.

"We have a long way to go in animal medicine before we can match what small-pox vaccine or sulfa drugs have done for humans.

## Several Amino Acids Made On Commercial Scale

"Along with veterinary medicine goes animal nutrition. The so-called animal protein factor caused quite a stir for some time, and mystified some of the best nutritionists in the country. There's still a lot to be learned about it.

"Protein itself, the yardstick of feed values, is being studied in terms of its constituent amino acids, and several of these can be synthesized on a commercial scale. But a cow can synthesize them all -- in her rumen or paunch. Urea, the simple nitrogen compound, can be included in the ration of cows or sheep along with good carbohydrate ingredients to replace up to one-third of the protein. Billions of micro-organisms in the animal's paunch or rumen can form complete protein from this feed in their own bodies. In effect, then, the cow is a chemical factory which converts urea and carbohydrates into the essential amino acids or proteins.

"Thus we don't actually feed the cow, but we feed the 'bugs' in her stomach!

"That's the simple basis for some of the famous corn-cob feeding results that you may have heard about.

"But with poultry and hogs, it still appears that all the important amino acids, a total of a dozen or so, must be supplied in the feed. So protein is still a very important factor in the quality of many feed crops, and of course it has always been important in wheat used for making flour."

Dr. Gordon referred to work done in Kansas, where the proper timing of the right amount of nitrogen fertilizer application has increased the protein content of the wheat. "Precision-feeding with nitrogen and possibly with other important plant-food elements promises quite exact control over the development and quality of various crops," he said.

## Regulation of Plant Growth Is Big Field

"And fertilizers have proved to be only the beginning in the development of chemicals for regulating plant growth. Some chemicals inhibit the development of potato sprouts in storage. Others make apples and pears stay on the tree longer -- so there will be fewer 'drops' in the orchard. Some other growth-regulating chemicals look promising for taking the leaves off cotton or soybeans before harvest -- so that mechanical harvesting equipment can do a more complete job.

"2,4-D started out as a 'plant hormone' or growth regulator. But the research workers found that while a little of it stimulated plant growth, too much would quite literally make the plants 'grow themselves to death'. So there was the long-sought weed-killer!"

After explaining how radioactive tracer elements were used in research with plants and animals, Dr. Gordon make this prediction:

"You future farmers may see in your lifetime more revolutionary changes in agriculture than have taken place since America was settled. Commonplace commercial practices today may be outmoded in five years.

## Agriculture and Democracy March Hand In Hand

"The march of agricultural science has accompanied the march of democracy. Our country has long been the most productive and best-fed nation on earth. During the war years American farmers increased their production one-third over the pre-Pearl Harbor harvests. And now the call is going out again -- for more production from farm people and their land.

"American agriculture is in a sound economic position. Farm debts are low. Farm assets are high. Living standards between city and country are nearly equalized -- with the edge now perhaps going to the farm family."

Speaking directly to the officers of the Future Farmers of America, he said in conclusion:

"You represent an important segment of our nation. You have a unique responsibility and opportunity for leadership and accomplishment -- today and in the many days and years that stretch ahead of you. For we can never let ourselves doubt that agriculture and industry, working together, can continue to aspire to bigger goals and ever-widening horizons."

The visiting FFA officers were Walter Cummins, 19, of Freedom, Okla., president; Robert Smith, 19, Buttonwillow, Calif., first vice president; Hal Davis, 20, Quincy, Fla., second vice president; Donald Jorgensen, 19, Lake City, Ia., third vice president; Richard Waybright, 20, Gettysburg, Pa., fourth vice president; and Wayne Staritt, 21, Catawba, W. Va., student secretary.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

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